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WINTER INJURY TO YOUNG WALNUT TREES DURING 1921-1922

By
L. D. Batchelor.

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WINTER INJURY TO YOUNG WALNUT TREES DURING 1921-1922

BY L. D. BATCHELOR

Unfavorable soil of climatic conditions which show little or no effect upon many species of orchard trees may seriously injure, if not actually kill, walnut trees. The effect of such unfavorable conditions is often first clearly manifested in the early spring, hence this class of troubles is generally known as winter injury. During March and April the tops of healthy trees make rapid growth, whereas the tops of injured trees show no growth whatever. Frequently unfavorable conditions not only cause the death of the uppermost twigs but also of some of the older branches. In extreme cases the trees may be killed nearly to the ground.

One of the most common causes of winter injury to walnut trees is the early fall frosts which may occur before the trees are dormant. Young trees are more likely to suffer from early frosts than mature bearing trees, because the latter become dormant earlier in the season. Walnut foliage which is still green and shows no sign of its normal autumn color is apparently as subject to frost injury as tender vegetables. The frosted foliage drops prematurely, and hence the green, immature twigs are fully exposed to the sun's heat during bright days in fall and winter. The moisture loss following the dropping of the leaves is much more rapid from the succulent twigs than from the more mature growth.

In many cases the twigs themselves show no actual injury at the time of the frost, but are eventually killed and show a marked sunburning following the loss of the leaves. Such prematurely defoliated twigs usually begin to show injury from sunburning about the middle of January. By early spring more or less of the new growth is dead. In occasional instances, however, a portion of the north side of twigs thus injured may remain healthy and produce normal growth the following spring. The death of the immature twigs is apparently

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due, not so much to the initial low temperature which killed the leaves, as to the subsequent sunburning. Vertical young shoots frequently show discolorations due to sunburning on the south side, throughout

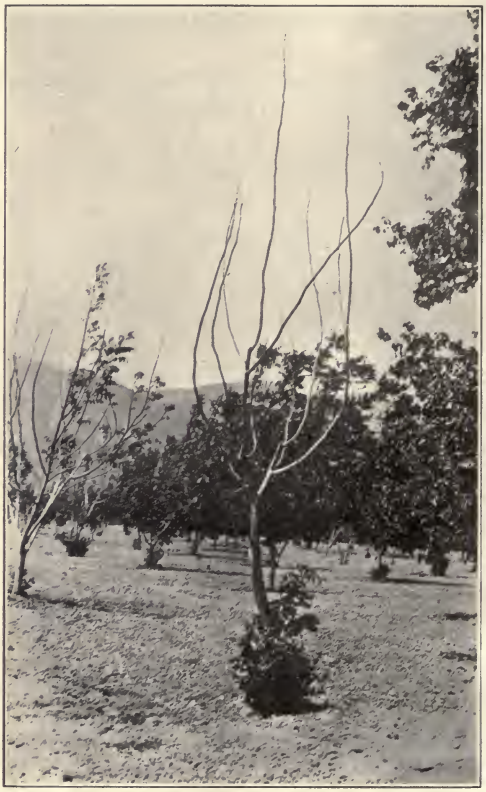

Fig. 1.—Three-year-old walnut tree killed nearly to the ground by early fall frosts.

their entire length, while horizontal or oblique branches usually show this sunburned area more strikingly, but on the upper sides only. Such a sunburned appearance of the young limbs in the spring is a prevailing characteristic of trees which have been only mildly frosted the previous fall before the trees were dormant. If the young trees

are very actively growing when the early frosts occur, or if the first frost is especially severe, the injury may be pronounced in the trunk as well as the limbs of trees one to five years old. In such severe cases the trees die back within a few inches of the ground. A tree thus affected is shown by figure 1. Inasmuch as the root systems are not

Fig. 2.—A two-year-old walnut tree regrown from a sprout which came out on original winter injured tree three inches from the ground.

injured by this condition, frosted and sunburned trees, as a general rule, produce a rank, succulent twig growth from the base of the main branches, the trunk, or the crown, depending on the injury, the summer following the initial injury. Such growth in turn is less likely to mature early and more likely to be injured by autumn frosts than the normal tree. When the cycle of events just described becomes established it thus tends to perpetuate itself.

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The fall of 1921 was an especially bad season for young walnut groves. The first fall frost did not come much earlier than normal, but it was much more severe than usual. The Hemet and San Jacinto valleys may be taken as an example of what occurred in many of the lower lying walnut areas. During a period of nineteen years the average date for the first killing frost in the autumn in San Jacinto is November 24. The first frosts are usually light, with absolute minimum temperatures of 27° or 28° F.

During the fall of 1921 the first killing frost in the San Jacinto and Hemet sections occurred on the night of November 17. A thermographic record in a walnut grove showed that a temperature of 26° F. occurred by 11 o'clock on the night of the 17th, and that it kept growing colder until daylight on the 18th, when the minimum temperature reached 20° F. The minimum temperatures on the 19th and 20th were 20° and 23° respectively. This degree of cold was sufficient to turn all the walnut leaves brown and crisp even though the trees had started to become dormant to the extent that the leaves were turning a yellowish green before the frost.

Judging by the appearance of some of the young trees thus far examined the current spring, the most pronounced injury may be in the trunks. The entire cambium layer of the trunks in many cases has turned black and the trees are dead to within a few inches of the ground. Meanwhile the small branches may show less apparent injury than the trunks. Many cases have been noted during this season, and also previous ones, where trees completely dead in the tops and most of the trunk showed a normal condition of the cambium layer 1 to 3 inches from the surface of the ground and a normal condition of the roots. Trees which are thus severely injured should not be pulled out and destroyed, inasmuch as many of them will probably sprout above the bud and a new tree can be trained into shape from such a sprout. If more than one sprout starts out from the base, the terminal buds on all but one should be pinched out and the most upright sprout retained for the future tree. An English walnut sprout may be seen among the black walnut sprouts in figure 1. Trees which are regrown in this manner should be supported during the first one or two seasons' growth. This may be accomplished by tying them to the dead trunk, or, better, by tying them to a $2'' \times 2''$ stake, which should be 5 or 6 feet high. The tree shown in figure 2 has been reformed from a sprout which came out of the original tree at the curve in the trunk, about 3 inches from the ground. The newly formed top is now two years old. Numerous young orchards have been severely injured in the past; the trouble was especially bad during the winter

of 1916–17, and again during 1919–20. By patience and persistence many such plantings have been regrown from the original trees at small expense, except the loss in time. Figure 3 shows an example of this experience.

Injury from frost may be prevented if it is possible to mature the young walnut trees early in the autumn so that the leaves will turn yellow and normally fall from the tree before the first early frosts, which frequently occur from the 1st to the 15th of November in many of the lowlands in southern California. Early maturity can be pro-

Fig. 3.—This young orchard was killed nearly to the ground by frosts in the fall of 1916. By persistence and patience the owner has regrown most of these trees, until it is now a creditable young orchard.

moted by withholding irrigation water in the late summer and early fall. Trees which are not irrigated after August 15 may be expected to mature earlier than trees watered in late August and September. During the past season of abnormal severity of the early fall frosts the above precaution was not always successful, especially in low frosty sites, on clean cultivated land, or where the August irrigation was particularly heavy. The young walnut trees interplanted with vegetable crops which ripened in the early fall, and thus took much of the soil moisture from the trees, thereby maturing them somewhat prematurely, are the least affected by the frost injury the current season. It is doubtful if any precautionary cultural or irrigation practice could have prevented a great deal of the damage which has been experienced this abnormal season.

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